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EXAMINER	
TUCKER, WESLEY J	

ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 02/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/920,003	BERKNER ET AL.
	Examiner	Art Unit
	Wes Tucker	2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-76* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21,23-28,31,33-56,59, and 63-76* is/are rejected.

7)☒ Claim(s) *22,29,30,32,57,58 and 60-62* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 September 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's response to the last office action filed September 26th 2005 has been entered and made of record.

2. Applicant has amended claims 15, 55 and 75. Claims 77-103 have been canceled. Claims 1-76 are currently pending.

3. Applicant's remarks have been considered and are found persuasive. A new rejection has been accordingly presented in view of reference to U.S. Patent 5,974,181 to Prieto.

4. Furthermore claims 15-32, 55-62 and 75-76 were previously indicated as containing allowable subject matter and were objected to as being dependent on rejected base claims. However these claims have been reexamined on the merits and are not found to be not allowable in view of the reasons listed below and in view of the references to both Prieto and Sato.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5, 8, 11, 12, 13, 36-44, 47, 50-53, 63, 64, 67, and 70-73 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,974,181 to Prieto.

With regard to claim 1, Prieto discloses a method comprising characterizing quantization noise in reconstructed data generated in response to application of an inverse wavelet transform (column 4, lines 14-27 and 56-63). Prieto teaches characterizing quantization noise by determining the noise cause by quantization that is uncorrelated to the image so that it can be filtered or removed.

Prieto further discloses removing the quantization noise from the reconstructed data constructed during decoding (column 4, lines 14-27). Prieto also discloses that the filtering or noise removal may be performed before or after the inverse wavelet transformation stage (column 4, lines 56-63).

With regard to claim 2, Prieto discloses the method defined in claim 1 wherein removing noise comprises performing wavelet denoising using an enhancement wavelet transform (column 4, lines 14-27). Here Prieto discloses that the wavelet transform is used to determine the noise and therefore the wavelet transform is used for the purposes of enhancement in the noise removal process.

With regard to claim 5, Prieto discloses the method defined in Claim 2 wherein performing wavelet denoising comprises applying the enhancement wavelet transform on a subset of all decomposition levels to which the inverse transform is to be applied

(column 5, lines 50-60 and column 6, lines 1-12). Prieto teaches that certain sub-bands are of greater importance to the image content and that certain sub-bands are of greater importance to the noise estimation. Prieto also teaches performing the denoising at the sub-band level (column 7, lines 23-30).

With regard to claim 11, Prieto discloses the method defined in Claim 1 wherein the quantization noise depends on quantization performed and the inverse wavelet transform applied (column 4, lines 17-24). Prieto discloses that the quantization noise is calculated with respect to noise created in the quantization process.

With regard to claim 12, Prieto discloses the method defined in Claim 1 further comprising:

decoding image data, including applying the inverse wavelet transform to compression wavelet transform coefficients at level L to generate samples at enhancement wavelet transform level L-1 having quantization noise (column 5, lines 24-36). Prieto discloses applying inverse wavelet transforms to multiple levels.

With regard to claim 13, Prieto discloses the method defined in Claim 12 further comprising repeatedly applying the inverse wavelet transform and removing quantization noise after each application of the inverse wavelet transform (column 3,

lines 55-60 and Fig. 2, element 223). The quantization noise is removed for multiple subbands each time they are decoded.

With regard to claim 36, Prieto discloses the method defined in Claim 1 wherein the quantization noise is not uniformly distributed throughout the reconstructed data (column 4, lines 14-27). It is understood that the quantization noise is not distributed uniformly throughout the reconstructed data because it is removed by filtering only certain noise caused by quantization as well as certain sub-bands (column 5, lines 50-60).

With regard to claim 37, Prieto discloses the method defined in Claim 1 wherein the quantization noise is not continuous throughout the reconstructed data (column 4, lines 14-27). It is understood that the quantization noise is not distributed uniformly throughout the reconstructed data because it is removed by filtering only certain noise caused by quantization as well as certain sub-bands (column 5, lines 50-60 and column 3, lines 55-60).

With regard to claim 38, Prieto discloses the method defined in Claim 1 wherein the quantization noise has discrete values (Fig. 2). The quantization noise as characterized is considered discrete as the noise is calculated after a discrete wavelet transform.

With regard to claim 39, Prieto discloses the method defined in Claim 1 wherein the quantization noise has rational values (column 4, lines 14-27).

With regard to claim 40, Prieto discloses the method defined in Claim 39 wherein the inverse wavelet transform is applied using a rational wavelet filter (column 4, lines 52-63). The adaptive filter is interpreted as a rational wavelet filter.

With regard to claim 41, Prieto discloses the method defined in Claim 1 wherein characterizing quantization noise comprises characterizing scalar quantization of wavelet coefficients (column 4, lines 14-27).

With regard to claim 42, Prieto discloses the method defined in Claim 1 wherein the quantization noise is scalar quantization noise (column 4, lines 14-27).

With regard to claim 43, Prieto discloses a decoder comprising:

an inverse wavelet filter unit to apply an inverse wavelet transform (Fig. 2, element 222);

a quantization noise characterization unit to characterize quantization noise in reconstructed data generated in response to application of the inverse wavelet transform (column 4, lines 14-27 and Fig. 2, element 214, the quantization encoder identifies the noise); and

a quantization noise removal unit to remove the quantization noise from the reconstructed data constructed during decoding (Fig. 2, element 223, the filter for removing noise can be placed both in front or behind the Inverse wavelet transform, see column 4, lines 52-67).

With regard to claim 44, Prieto discloses the decoder defined in Claim 43 wherein the quantization noise removal block comprises a denoising unit to perform wavelet denoising using an enhancement wavelet transform (Fig. 2, element 223).

With regard to claim 47, Prieto discloses the decoder defined in Claim 44 wherein performing wavelet denoising comprises applying the enhancement wavelet transform on a subset of all decomposition levels to which the inverse transform is to be applied ((column 5, lines 50-60 and column 6, lines 1-12). Prieto teaches that certain sub-bands are of greater importance to the image content and that certain sub-bands are of greater importance to the noise estimation. Prieto also teaches performing the denoising at the sub-band level (column 7, lines 23-30 and column 3, lines 55-60).

With regard to claim 51, Prieto discloses the decoder defined in Claim 43 wherein the quantization noise depends on quantization performed and the inverse wavelet transform applied (column 4, lines 17-24). Prieto discloses that the quantization noise is calculated with respect to noise created in the quantization process.

With regard to claim 52, Prieto discloses the decoder defined in Claim 43 wherein the inverse wavelet filter unit applies the inverse wavelet transform to compression wavelet coefficients at level L to generate samples at the enhancement wavelet transform level L-1 having quantization noise (column 5, lines 24-36). Prieto discloses applying inverse wavelet transforms to multiple levels.

With regard to claim 53, Prieto discloses the decoder defined in Claim 51 wherein the inverse transform unit repeatedly applies the inverse wavelet transform and the quantization noise removal unit removes quantization noise after each application of the inverse wavelet transform (column 3, lines 55-60 and Fig. 2, element 223). The quantization noise is removed for multiple subbands each time they are decoded.

With regard to claim 63, the discussion of claim 43 applies. Prieto discloses an article of manufacture comprising one or more recordable media with executable instructions stored thereon which, when executed by a system (Fig. 2). The diagram in Fig. 2 is interpreted to be performed by a computer product to perform the steps discussed in regard to claim 43.

With regard to claim 64, the discussion of claim 44 applies.

With regard to claim 67, the discussion of claim 46 applies.

With regard to claim 70 the discussion of claim 50 applies.

With regard to claim 71, the discussion of claim 51 applies.

With regard to claim 72, the discussion of claim 52 applies.

With regard to claim 73, the discussion of claim 53 applies.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 76 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,985,632 to Sato et al.

With regard to claim 76 Sato discloses applying an inverse discrete wavelet transform to LL coefficients and high-pass coefficients at level L to generate samples at level L-1 having quantization noise (column 15, lines 30-50 an dcolumn 16, lines 30-50); and

Removing the quantization noise in reconstructed LL components computed duting the inverse wavelet transform, wherein the quantization noise depends on quantization performed and the inverse wavelet transform applied (column 16, lines 30-50).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 8 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent 5,974,181 to Prieto and U.S. Patent 5,974,181 to Prieto et al.

With regard to claim 8, Prieto discloses the method of claim 1 but does not explicitly disclose that the inverse wavelet transform takes place in a JPEG 2000 encoder. Sato discloses that the inverse wavelet transform takes place in a JPEG 2000 encoder (paragraph 0082). JPEG decoders are well known in the art to be used because of the properties of JPEG images, making them suitable for performing lossless transformations. Therefore it would have been obvious to one of ordinary skill

in the art at the time of invention to use a JPEG 2000 decoder to enable lossless transformations in the quantization noise removal of Prieto.

With regard to claim 50, the discussion of claim 8 applies.

Claims 3, 4, 6, 7, 9, 10, 14, 35, 45, 46, 48, 49, 54, 65, 66, 68, 69 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,974,181 to Prieto.

With regard to claims 3 and 4 Prieto discloses the method defined in claim 2, but does not disclose whether the enhancement wavelet transform is either a different transform than the inverse wavelet transform or the same as the inverse wavelet transform. Official notice is taken that many different wavelet transforms are well known in the art to be used according to experimentation and need. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use any wavelet transform as a matter of design choice chosen through the process of routine experimentation according to desired effect.

With regard to claims 6 and 7, Prieto discloses the method defined in Claim 5, but chooses to omit the details of which subsets of decomposition levels comprise a set of consecutive or non-consecutive decomposition levels. Official notice is taken that the

details of wavelet denoising on different decomposition levels in both consecutive and nonconsecutive levels is well known in the art. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use any consecutive or non-consecutive decomposition levels as a matter of design choice chosen through the process of routine experimentation according to desired effect.

With regard to claim 9, Prieto discloses the method defined in Claim 2, but omits the details of wherein performing wavelet denoising comprises controlling denoising using level 2 enhancement wavelet transform coefficients. However official notice is taken that many levels for enhancement are well known in the art of wavelet denoising according to desired effect. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use any advantageous level be chosen due to routine experimentation to achieve a desired result.

With regard to claim 10, the discussion of claim 9 applies.

With regard to claim 14, Prieto discloses the method defined in Claim 1, but does not disclose further performing a deblurring operation on the reconstructed samples to enhance sharpness of an image. Official notice is taken that deblurring operations to increase sharpness are well known in the art to be used to sharpen images to make them more appealing. Therefore it would have been obvious to one of ordinary skill in

the art at the time of invention to use a deblurring operation in order to increase sharpness for a more appealing image.

With regard to claim 35, Prieto discloses the method defined in Claim 1 wherein characterizing quantization noise comprises computing differences between neighboring samples. Official notice is taken that it is well known in the art to calculate quantization noise or any type of noise for that matter by computing differences between image components in order to obtain the values that are out of place i.e. noise values. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to characterize quantization noise by computing differences between neighboring samples in order to obtain values that are out of place and are deemed to be noise.

With regard to claims 45 and 46, the discussion of claims 3 and 4 applies.

With regard to claims 48 and 49 the discussion of claims 6 and 7 applies.

With regard to claim 54, the discussion of claim 14 applies.

With regard to claims 65 and 66, the discussions of claims 3, 4, 45 and 46 apply.

With regard to claims 68 and 69 the discussion of claims 6, 7, 48 and 49 apply.

With regard to claim 74, the discussion of claims 14 and 54 apply.

Claims 15- 21, 23-28, 31, 55-56, 59 and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent 5,974,181 to Prieto and U.S. Patent 6,985,632 to Sato et al.

With regard to claim 15, Prieto discloses a method comprising characterizing quantization noise in reconstructed data generated in response to application of an inverse wavelet transform (column 4, lines 14-27 and 56-63). Prieto teaches characterizing quantization noise by determining the noise caused by quantization that is uncorrelated to the image so that it can be filtered or removed.

Prieto further discloses removing the quantization noise from the reconstructed data constructed during decoding (column 4, lines 14-27). Prieto also discloses that the filtering or noise removal may be performed before or after the inverse wavelet transformation stage (column 4, lines 56-63).

Prieto does not explicitly disclose wherein the removing quantization noise comprises applying an M-level forward transform to LL components, thresholding coefficients, and applying an inverse transform to threshold coefficients to create denoised LL components.

Sato discloses removing noise this way by:

Applying an M-level forward transform to LL components (column 15, lines 1-5);

Thresholding coefficients (column 15, lines 34-55 and column 16, lines 30-50); and

Applying a M-level inverse transform to create denoised LL components (column 16, lines 30-50).

The practice of removing noise using wavelet denoising techniques is well known in the art to be advantageous when removing noise that is attributable to certain frequencies. Therefore it would have been obvious to one of ordinary skill I the art at the time of invention to use the wavelet noise removal process taught by Sato in conjunction with the noise removal of Prieto in order to remove noise associated with particular frequencies or sub-bands of the image to be enhanced.

With regard to claim 16, Sato discloses wherein thresholding coefficients comprises determining a threshold based on a scalar quantizer Q, where Q is a rational number (column 15, lines 6-15). Sato discloses that the coefficients are obtained using a quantizer and therefore would be thresholded according to the quantizer. Whether or not Q is a rational number is a matter of design choice. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use a rational quantizer due to routine experimentation and in accordance with desired calculations to be performed.

With regard to claim 17, having a threshold of 1/sqrt(2)*Q is also a matter of design choice and would of depend on the amount of noise or values of coefficients to be discarded. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use a threshold calculated due to routine experimentation and in accordance with desired calculations to be performed.

With regard to claim 18, again the same discussion of design choice applies. A certain wavelet transform of the many well known wavelet transforms may be chosen according to design choice resulting from routine experimentation and desired results.

With regard to claim 19, the discussion of claim 17 applies.

With regard to claims 20 and 21, the discussion of claim 18 applies.

With regard to claim 23, Sato discloses using JPEG 2000 coding (column 22, lines 37-42).

With regard to claim 24, Sato discloses determining coefficients and therefore thresholds for different regions of interest (column 15, lines 45-51).

With regard to claim 25, Sato discloses wherein different regions of samples correspond to different codeblocks of wavelet coefficients (column 15, lines 52-58).

With regard to claim 26, Sato discloses wherein different samples have different last coding passes (column 22, lines 37-42).

With regard to claim 27, the discussion of claim 18 applies. It is a matter of design choice for M to equal one.

With regard to claim 28, the discussion of claim 18 applies. Harr transforms are just one of many transform types that can be used as a matter of design choice.

With regard to claim 31, Sato discloses thresholding coefficients or removing them effectively setting them to zero according to comparison with a threshold (column 16, lines 30-50).

With regard to claim 55, the discussion of claim 15 applies.

With regard to claim 56, the discussion of claim 16 applies.

With regard to claim 59, the discussion of claim 31 applies.

With regard to claim 75, the discussion of claim 31 applies.

Allowable Subject Matter

Claims 22, 29, 30, 32, 57, 58 and 60-62 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for indicating allowable subject matter:

Claims 22, 29, 30, 32, 57, 58 and 60-62 all contain specifics in the calculation of wavelet transforms that are not explicitly disclosed nor reasonably suggested by either reference to Sato or Prieto or any other found prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wes Tucker whose telephone number is 571-272-7427. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on 571-272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Wes Tucker

1-20-06

VIKKRAM BALI
PRIMARY EXAMINER